(NASA-CR-161587) SOLAR HOT WATER SYSTEM INSTALLED AT MOBILE, ALABAMA Final Report (La Quinta Motor Inns, Inc.) 28 p HC A03/MF A01 CSCL 10A

N81-13461

Unclas G3/44 29390

DOE/NASA CONTRACTOR REPORT

DOE/NASA CR-161587

SOLAR HOT WATER SYSTEM INSTALLED AT MOBILE, ALABAMA - FINAL REPORT

Prepared from documents furnished by

LaQuinta Motor Inns, Inc.
P. O. Box 32064
San Antonio, TX 78216

Under DOE Contract 77-G-01-1623

Monitored by

National Aeronautics and Space Administration
George C. Marshall Space Flight Center, Alabama 35812

For the U. S. Department of Energy

U.S. Department of Energy

Solar Energy

TABLE OF CONTENTS

MOBILE, ALABAMA

I. KEY WORD ABSTRACT

Application	Domestic Hot Water
Collector Type	Flat Plate, Liquid
Collector Manufacturer	Raypak, Inc.
Collector Area	1990 sq. ft. (Approximate)
Storage Capacity	2500 gallons
Hot Water Load	7.36×10^8 BTU/year
BTU's Produced	4.95×10^8 BTU/year
Building Owner	La Quinta Motor Inns, Inc.
Solar System Designer	Travis-Braun & Associates
Contractor (Installer)	Professional Plumbing & Heating

II. INTRODUCTION

La Quinta Motor Inns, Inc. retained Travis-Braun & Associates to design a solar assisted domestic hot water system for the new 122 unit La Quinta Motor Inn in Mobile, Alabama. The system was designed to supply approximately two thirds of the total hot water load. The Inn is a low-rise, two story building with flat roof for installation of solar panels.

III. DESIGN PHILOSOPHY

The Mobile, Alabama property was chosen for solar installation because of the favorable climatic condition and also because electric hot water heating was specified for this property in response to the Government's request to conserve natural gas during the energy crunch of the 1970's.

The system consists of six rows of ten collectors and three rows of eleven collectors mounted on the roof of the property. Griswald flow control valves were installed to regulate the flow to each row. Two Heliotrope electronic thermometers with a combined capability of measuring the temperatures of 22 different locations were installed for monitoring purposes.

Two heat exchanger tube bundles were installed in the 2500 gallon storage for transferring the solar heat to the domestic hot water system.

A. Collectors

The collectors chosen for this project were Model SG-18P manufactured by Raypak, Inc. A total of 93 collectors were used. The collectors were supplied with Model PR-18 Solar Panel Rack Kit which successfully withstood the force of Hurricane Frederick without any structural damage.

(See attached sheets on Raypak collectors.)

B. Storage System

A 2500 gallon insulated vertical steel storage tank was located outdoors next to the Inn's cooling tower. Temperature sensors and thermometers were installed in the storage tank for control function as well as monitoring purposes. A 1/12 Hp Grundfos recirculating pump was installed to improve heat transfer between the heat exchangers and stored water.

C. Heat Exchangers

Two heat exchanger tube bundles were mounted into the storage tank. The upper heat exchanger which served to extract heat from the storage tank to the domestic hot water system was sized for 100 gpm at 10°F temperature rise. The lower heat exchanger which served to transfer heat from the solar collectors to the storage tank was sized for 51 gpm at 10°F temperature drop.

A solution of ethylene glycol was used as heat transfer fluid between the solar collectors and the lower heat exchanger. With the use of the upper heat exchanger for the domestic hot water system, a double wall separation was achieved between the domestic hot water system and the ethylene glycol.

D. Pump and Controls

Two solar loop pumps, each sized for 100% of the solar system requirements were installed. The pumps are controlled by a temperature differential controller with an alternator for equal usage of the pumps.

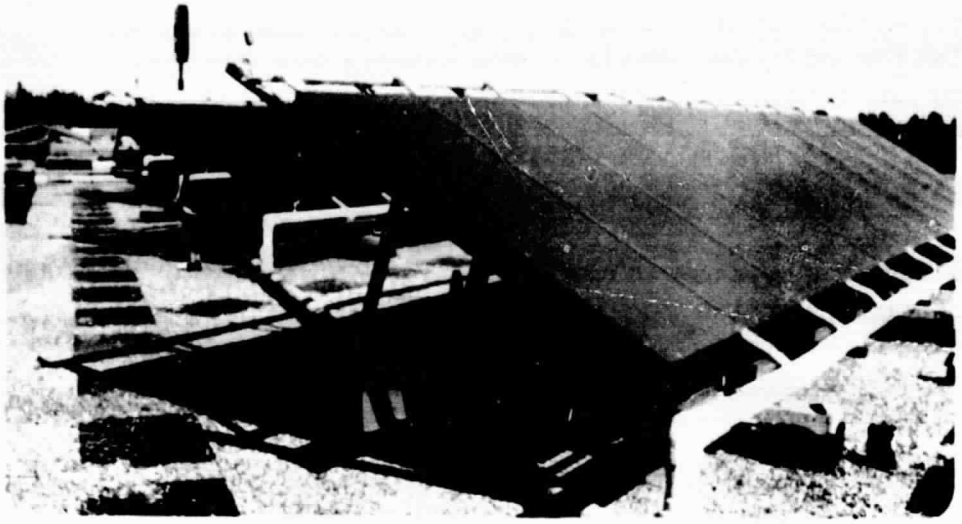
IV. OPERATION OF THE SYSTEM

The system was put into operation in the summer of 1979. Except for a few minor leaks in the piping, the system performed as designed until the property was struck by Hurricane Frederick in September of 1979. Flying debris did extensive damage to the solar panels and the solar system was delayed due to the need to wait for the completion of roof repair. The system was finally repaired by the end of January, 1980 and has been operating satisfactorily since then.

V. PROBLEMS ENCOUNTERED AND SOLUTIONS

In checking out the system after repairing the damages inflicted by Hurricane Frederick, it was noted that a few temperature readings were illogical. This was traced to incorrect wiring connections and true readings obtained after re-wiring.

VI. PICTURES OF FINAL INSTALLATION



1. Solar Collector Field

2. Cooling Tower and Solar Hot Water Storage Tank

APPENDIX A

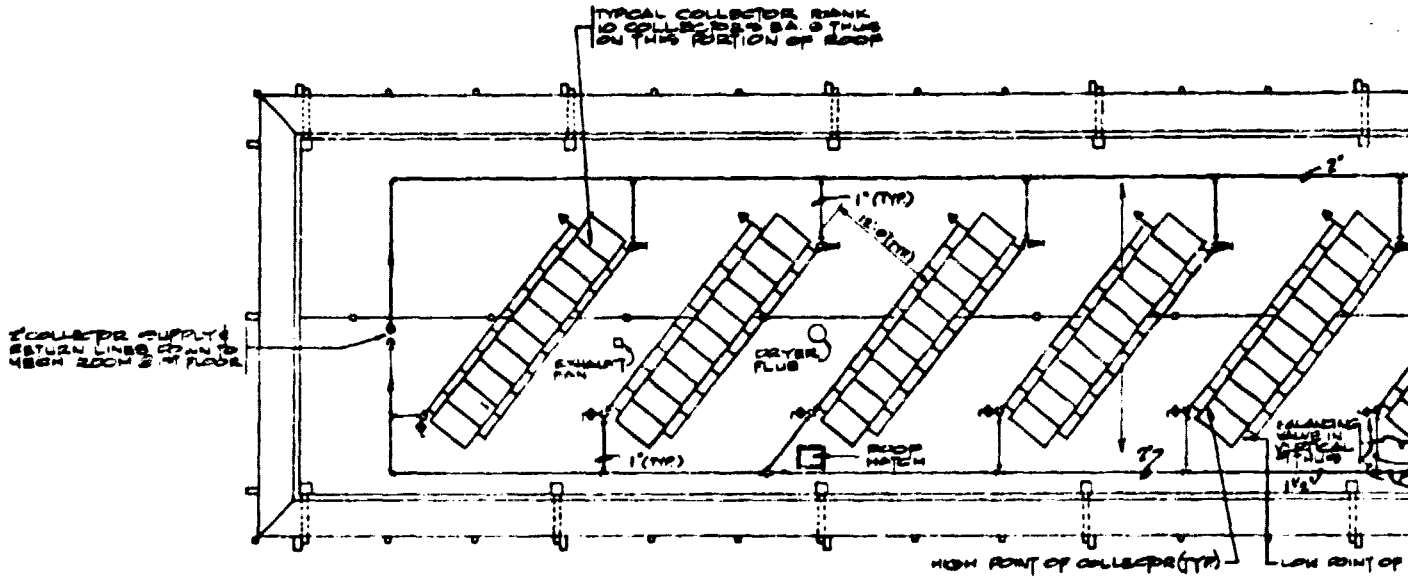
ROOF PLAN/SOLAR

FOR

LA QUINTA MOTOR INNS, INC.

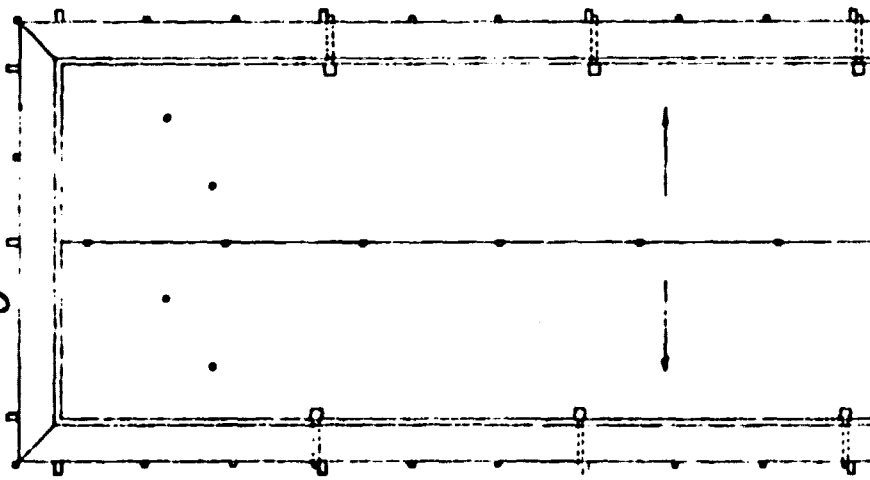
MOBILE, ALABAMA

GENERAL NOTE
CONTRACTOR TO VERIFY NORTH-SOUTH FRAMING AND TO LOCATE COLLECTOR PANELS FACING DUE SOUTH



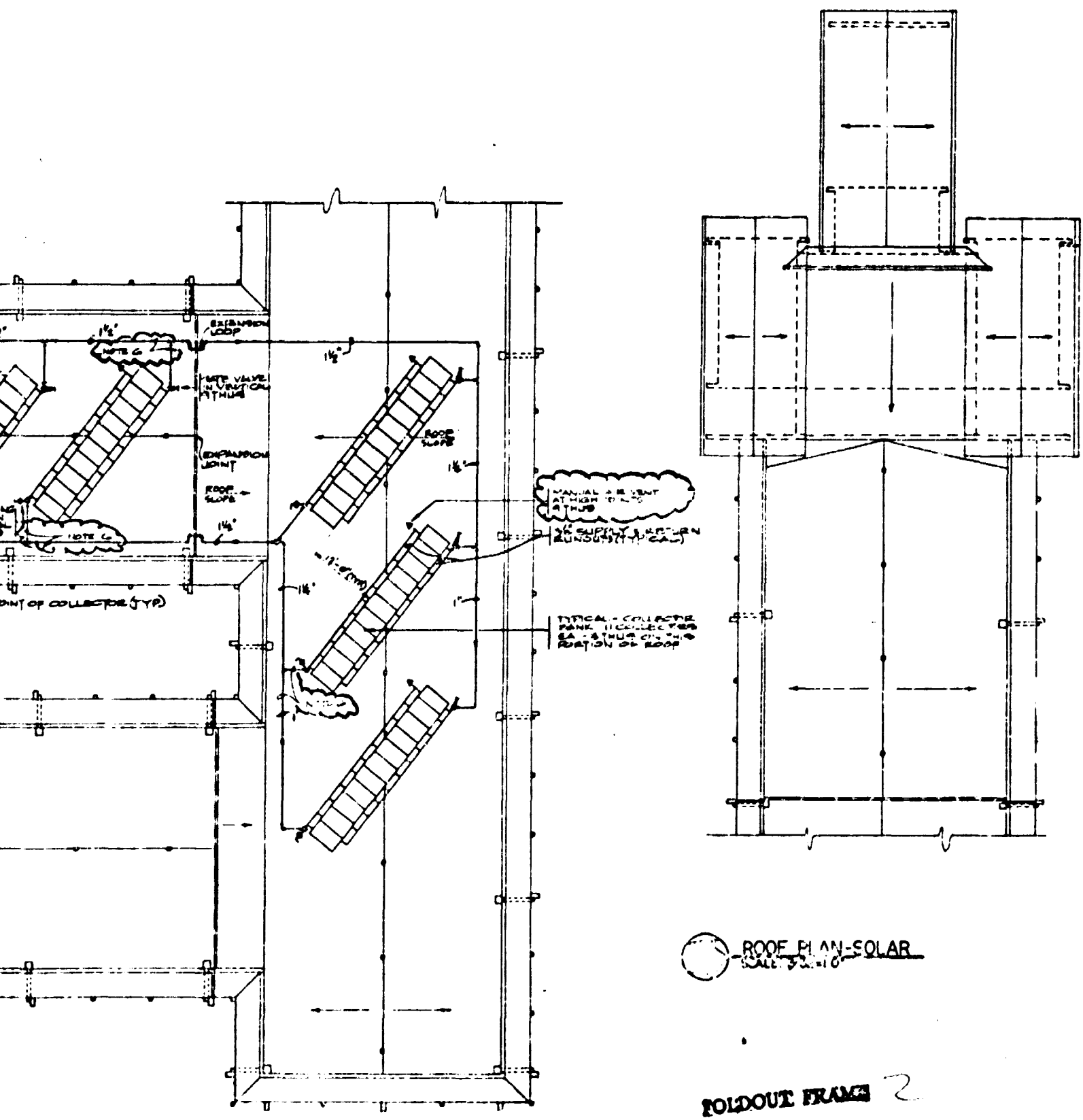
SOLAR NOTES

1 COLLECTOR INFORMATION



ORIGINAL PAGE IS
OF POOR QUALITY

FOLDOUT FRAME



ROOF PLAN-SOLAR

FOLDOUT FRAME 2

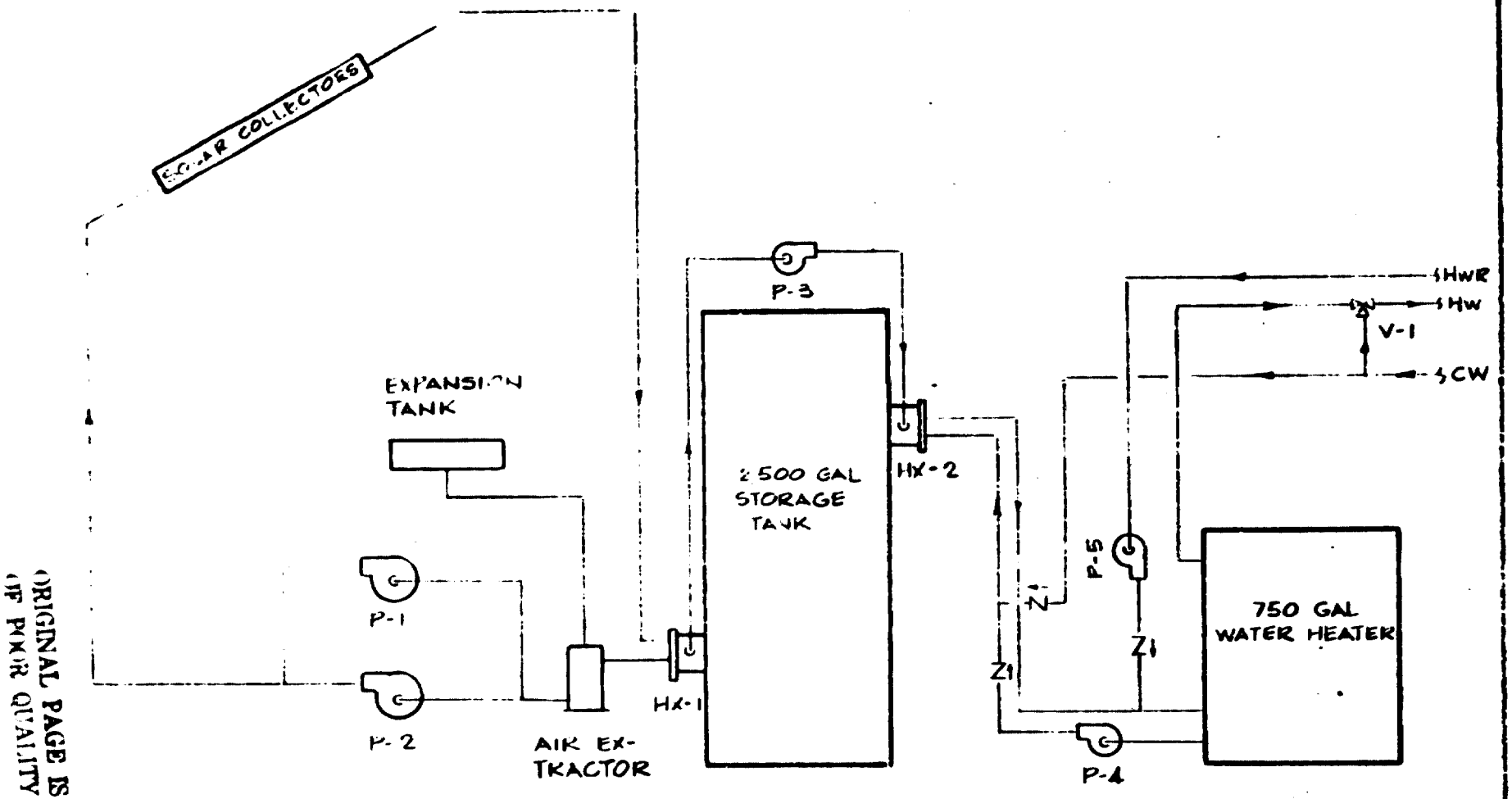
A-2

APPENDIX B

OPERATOR'S INSTRUCTIONS

AND

MAINTENANCE MANUAL



SOLAR SYSTEM SCHEMATIC	LA QUINTA MOTOR INN MOBIL ALABAMA

I

GENERAL DISCUSSION

This is a closed solar system utilizing two heat exchangers to transfer heat from the solar collectors to the domestic hot water system. Please refer to attached schematic drawing of the solar system.

P-1 and P-2 are solar loop pumps that circulate a solution of ethylene glycol and water between the solar collectors and the heat exchanger, HX-1. Only one solar loop pump is needed for the system operation, the other solar loop pump serves as 100% standby. The solar loop pumps are controlled by a temperature differential controller which starts the pump when the temperature at the solar collectors is 15°F higher than the temperature in the 2500 gallon storage tank. The temperature differential controller will de-activate the solar loop pump when the temperature at the solar collectors is not more than 3°F higher than the temperature in the 2500 gallon storage tank. An alternator alternates the operation of P-1 and P-2 for equal usage.

P-3 is a recirculating pump to improve the heat transfer between the heat exchangers and the stored water in the 2500 gallon storage tank. P-3 is interlocked with P-1 and P-2 so that if either P-1 or P-2 is activated, so will P-3.

Domestic cold water will enter heat exchanger, HX-2, to be preheated before entering the 750 gallon water heater. When the temperature in the 2500 gallon storage tank reached a minimum of 10°F higher than the temperature of the water in the 750 gallon water heater, another temperature differential controller will activate pump P-4 to transfer the heat from the 2500 gallon storage tank to the 750 gallon water heater. Pump P-4 will be de-activated when the temperature in the 2500 gallon storage tank is only 5°F higher than the temperature of the 750 gallon water heater.

P-5 is the usual hot water recirculating pump of the buildings hot water system.

Mixing valve, V-1 is set to prevent the temperature of the hot water supplied to the building from exceeding 140°F.

II

MAINTENANCE REQUIREMENTS

1. Once a Week:

   a. Check fluid level in the solar system expansion tank. If low, add a 50-50 mixture of ethylene glycol and water to the system. CAUTION: NEVER ADD PLAIN WATER TO THE SYSTEM.

2. Once a Month:

   a. Wash glass surfaces of the solar collectors using a mild detergent solution and a soft brush. Thoroughly rinse with clean water.

   b. Check temperature differential controllers and alternator for proper operation.

   c. Check for fluid leaks from collectors and piping.

3. Once a Year:

   a. Check pump seals for leakage.

   b. Draw a sample of heat transfer fluid from the solar system for analysis and determination of any action needed to provide maximum corrosion inhibition.

APPENDIX C

MANUFACTURER'S LITERATURE

The solar collector panels shall be Raypak Model SG-18P. Overall measurements, including tie-down brackets shall be 37⅛ X 82¼ X 3¾ and weigh 105 lbs. (Model DG-18P – 37⅛ X 82¼ X 4⅛ and weigh 135 lbs.).

Waterways to be of grid design, consisting of 3/8" OD copper tubing on 3½" centers terminated in 5/8" OD copper headers, and soldered with high temperature silver solder. Water inlet and outlet located on top and bottom of the panel, will be ¾" copper solder fittings for both panels.

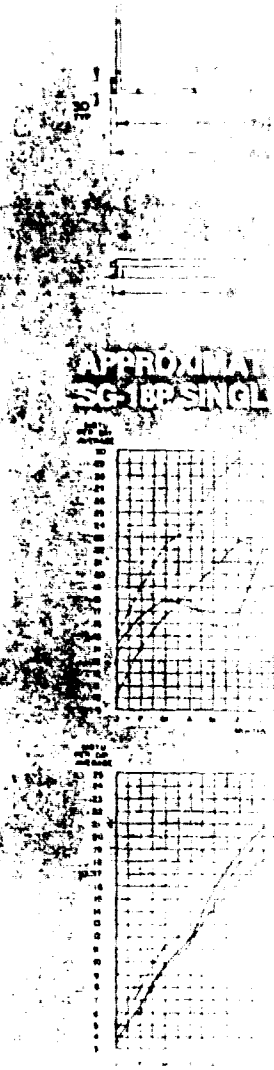
The absorber surface shall be .020 aluminum which is swage fitted over the 3/8" copper tubing to form a tight fit for good heat transfer, and the absorber plate shall have flat black thermal setting paint baked at 400°F. on all single and double glaze panels.

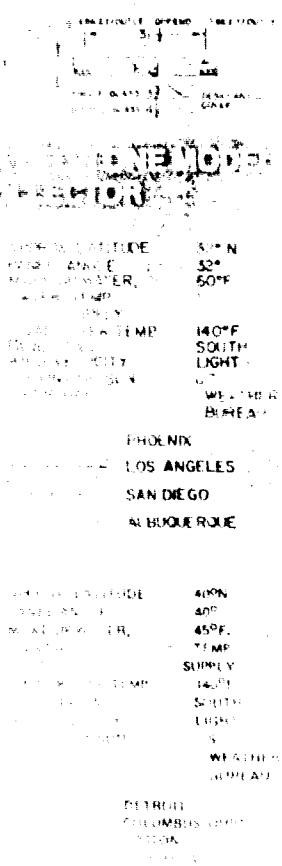
All panel containers will be constructed of 20 gauge metal, galvanized and painted with a baked enamel finish. The cabinets shall have 3" of one-pound insulation on the bottom and 2" of three-pound insulation around the perimeter. The U factor of the casing bottom and sides shall be .065 and .032 BTU/FT^2. The absorber plate shall be isolated from the cabinet with neoprene grommets and isolators. Removable desiccant package shall be accessible through weather-proof plate.

The upper portion of the single glaze collector shall consist of one sheet of .02% low iron double strength tempered glass with a spectral value of 91.5%. (Double glaze consists of two sheets with a spectral value of 83.7%). The tempered glass is to be produced to Federal Specifications DD-G 140 3b.

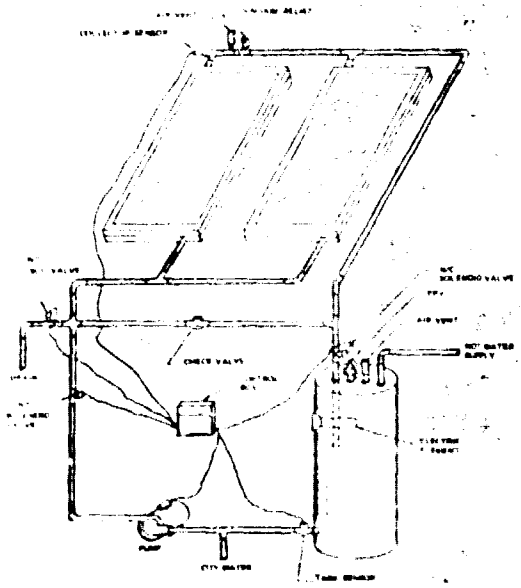
Glass shall be held in place by specially designed holding blocks. High temperature rubber stripping will insulate and isolate glass from the cabinet. The glass retainer frame shall be easily removable vertically to allow replacement of glass or absorber plate without disturbing the cabinet. All components shall be totally field replaceable.

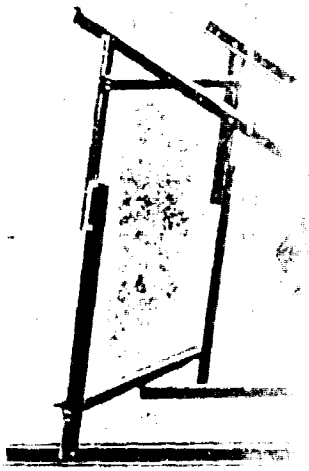
Collector shall be capable of withstanding temperatures to 350°F. with no flow of circulating media.

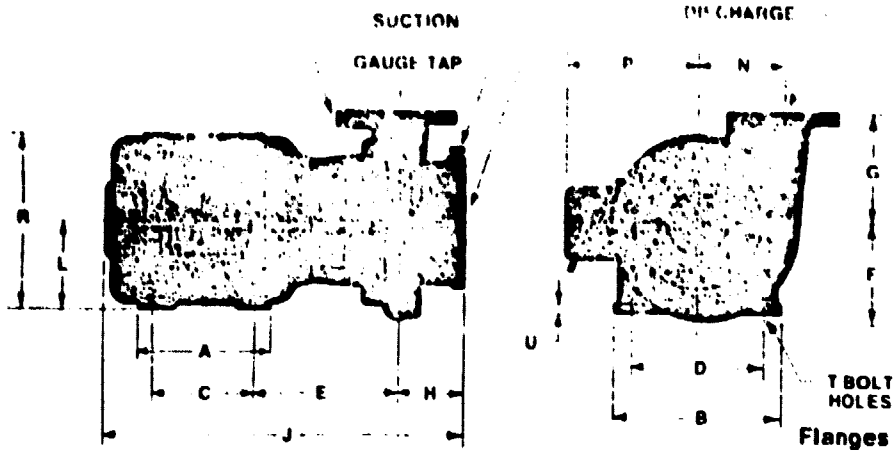




Today, in
installation
savings in less







PUMP CONSTRUCTION
BRONZE FITTED
MECHANICAL SEAL

MOTOR 200 208 OR
230 460 VOLT 60 CYCLE
3 PHASE DRIPPROOF
ENCLOSURE

MAXIMUM WORKING PRESSURE 175

Flanges drilled and faced per 125# ANSI Standar

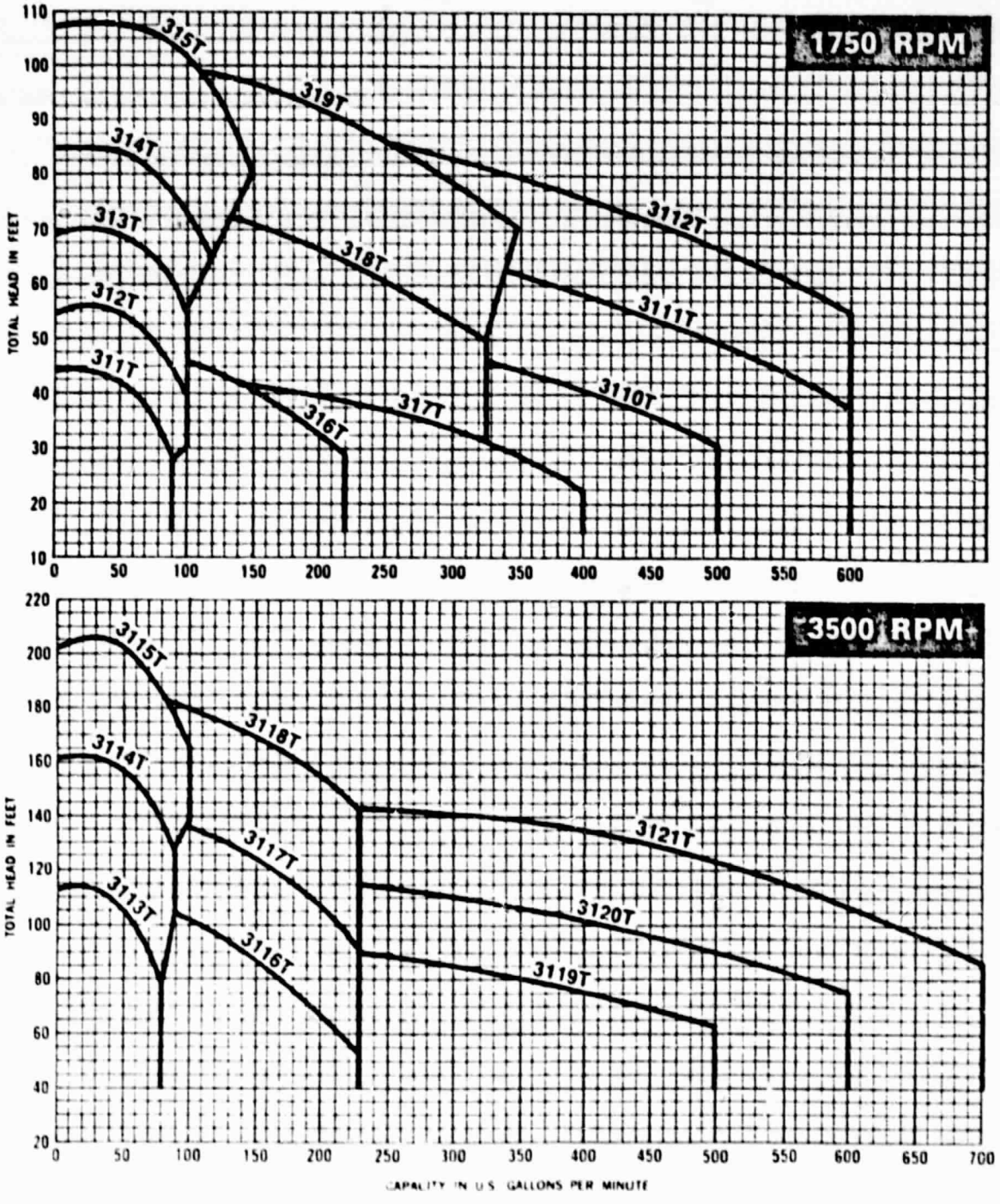
UNIT NO.	DISCHARGE	SUCTION	PUMP DIMENSIONS (INCHES)			
			F	G	H	N
311T	1½AB NPT	2 NPT	5	6	3⅛	4⅝
312T	1½AB NPT	2 NPT	5	6	3⅛	4⅝
313T	1½BB NPT	2 NPT	6¼	6½	3⅛	5¾
314T	1½BB NPT	2 NPT	6¼	6½	3⅛	5¾
315T	1½BB NPT	2 NPT	6¼	6½	3⅛	5¾
316T	2½A FLGD	3 FLGD	5½	6	3⅝	4 11/16
317T	3AB FLGD	4 FLGD	6¼	6	4⅛	5
318T	2½B FLGD	3 FLGD	6⅞	6¾	3½	6
319T	2½B FLGD	3 FLGD	6⅞	6¾	3½	6
3110T	4BB FLGD	5 FLGD	7⅝	7½	4¾	6⅝
3111T	4BB FLGD	5 FLGD	7⅝	7½	4¾	6⅝
3112T	4BB FLGD	5 FLGD	7⅝	7½	4¾	6⅝
3113T	1½AB NPT	1½ NPT	4¼	5	2⅝	4½
3114T	1½AB NPT	1½ NPT	4¼	5	2⅝	4½
3115T	1½AB NPT	1½ NPT	4¼	5	2⅝	4½
3116T	2AB FLGD	2½ FLGD	5¼	6½	3	4¾
3117T	2AB FLGD	2½ FLGD	5¼	6½	3	4¾
3118T	2AB FLGD	2½ FLGD	5¼	6½	3	4¾
3119T	3AB FLGD	4 FLGD	6¼	6	4⅛	5
3120T	3AB FLGD	4 FLGD	6¼	6	4⅛	5
3121T	3AB FLGD	4 FLGD	6¼	6	4⅛	5

UNIT NO.	MOTOR			MOTOR DIMENSIONS (INCHES)									
	FRAME	H.P.	R.P.M.	A (Max.)	B (Max.)	C	D	E	J (Max.)	L	P	R	T	U
311T	143JM	1	1750	6	7	4	5½	7½	18⅞	3½	5¾	7	11/32	¼
312T	145JM	1 5	1750	6	7	5	5½	7½	18⅞	3½	5¾	7	11/32	¼
313T	145JM	2	1750	6	7	5	5½	7½	18⅞	3½	5¾	7	11/32	¼
314T	182JM	3	1750	6½	9	4½	7½	8¼	21¾	4½	8⅛	9¼	11/32	7/16
315T	184JM	5	1750	7½	9	5½	7½	8¼	21¾	4½	8⅛	9¼	13/32	7/16
316T	145JM	2	1750	6	7	5	5½	7 9/16	19⅛	3½	5¾	7	11/32	¼
317T	182JM	3	1750	6½	9	4½	7½	8½	23	4½	8⅛	9¼	13/32	7/16
318T	184JM	5	1750	7½	9	5½	7½	8⅛	22¼	4½	8⅛	9¼	13/32	7/16
319T	213JM	7 5	1750	7½	10½	5½	8½	9¼	24⅜	5¼	8¾	10⅛	13/32	½
3110T	184JM	5	1750	7½	9	5½	7½	8¾	23¾	4½	8⅛	9¼	13/32	7/16
3111T	213JM	7 5	1750	7½	10½	5½	8½	9⅜	26	5¼	8¾	10⅛	13/32	½
3112T	215JM	10	1750	9	10½	7	8½	9⅜	27½	5¼	8¾	10⅛	13/32	½
3113T	145JM	3	3500	6	7	5	5½	7½	18½	3½	5¾	7	11/32	¼
3114T	182JM	5	3500	6½	9	4½	7½	8¼	21¾	4½	8⅛	9¼	13/32	7/16
3115T	184JM	7 5	3500	7½	9	5½	7½	8¼	21¾	4½	8⅛	9¼	13/32	7/16
3116T	182JM	5	3500	6½	9	4½	7½	8¼	21¾	4½	8⅛	9¼	13/32	7/16
3117T	184JM	7 5	3500	7½	9	5½	7½	8¼	21¾	4½	8⅛	9¼	13/32	7/16
3118T	213JM	10	3500	7½	10½	5½	8½	9⅛	23¾	5¼	8¾	10⅛	13/32	½
3119T	213JM	10	3500	7½	10½	5½	8½	9 5/16	25¼	5¼	8¾	10⅛	13/32	½
3120T	215JM	15	3500	9	10½	7	8½	9 5/16	26¾	5¼	8¾	10⅛	13/32	½
3121T	254JP	20	3500	10¾	12½	8¼	10	13¾	33½	6¼	9⅞	13	17/32	¾

Series 1531 pumps available from stock SELECTION

An important feature of the 1531 Type B pumps is the availability of the most commonly used pump-body and motor combinations from factory stock. These stock pumps assure quick service when immediate shipment of pumps is required. All stock pumps are of bronze fitted construction.

Each pump is available with 208 or 230/460 volt, 60 cycle, 3 phase dripproof motor. For pump capacities or motor characteristics other than those shown see pages 8 through 11.

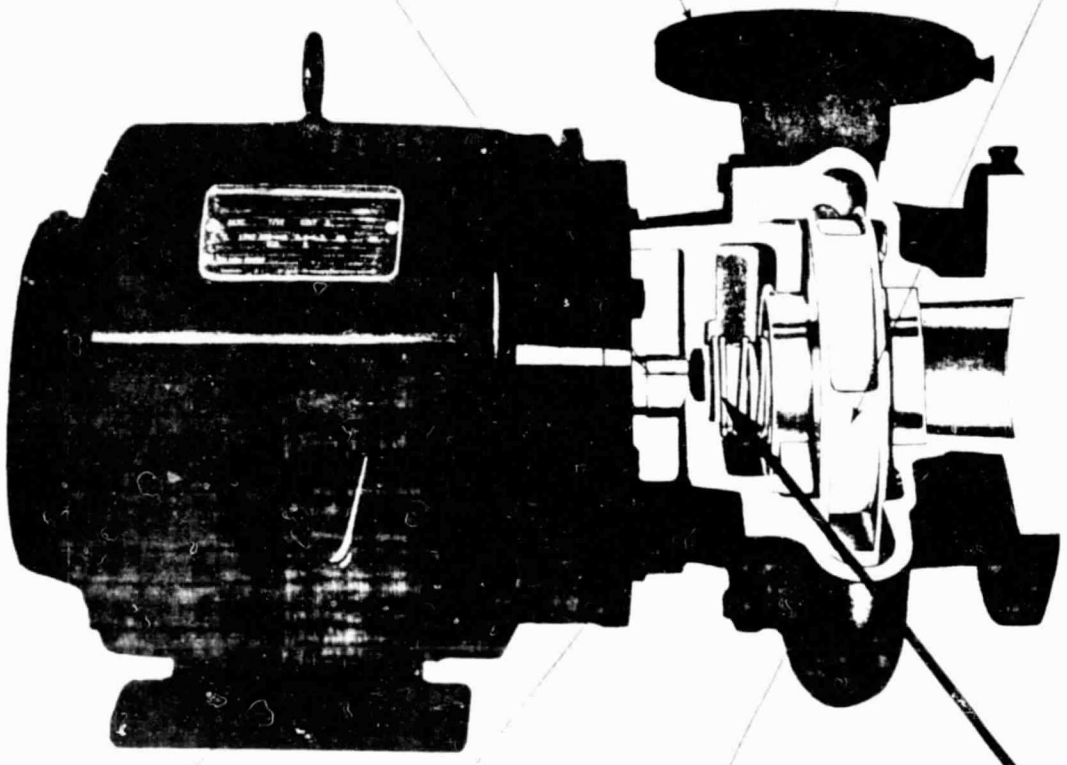


VERTICAL
SPLIT-CASE DESIGN

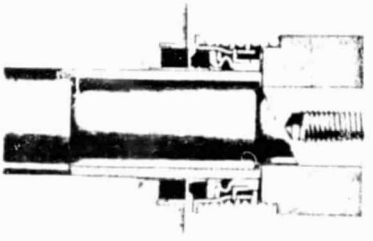
PERFORMANCE PROVED

DYNAMICALLY AND
HYDRAULICALLY
BALANCED IMPELLER

DURABLE
PUMP SHAFT



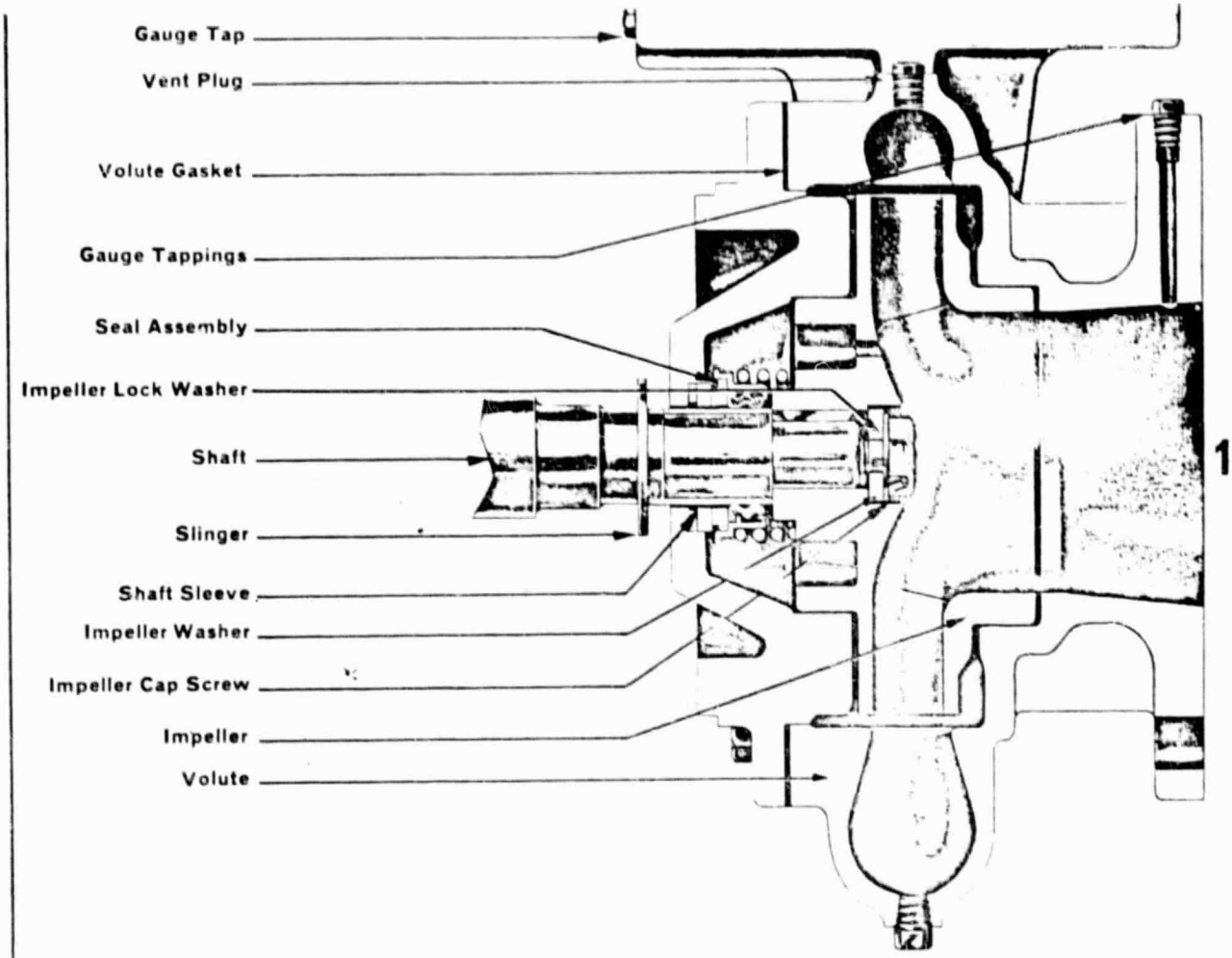
TIME PROVEN
MECHANICAL SEAL



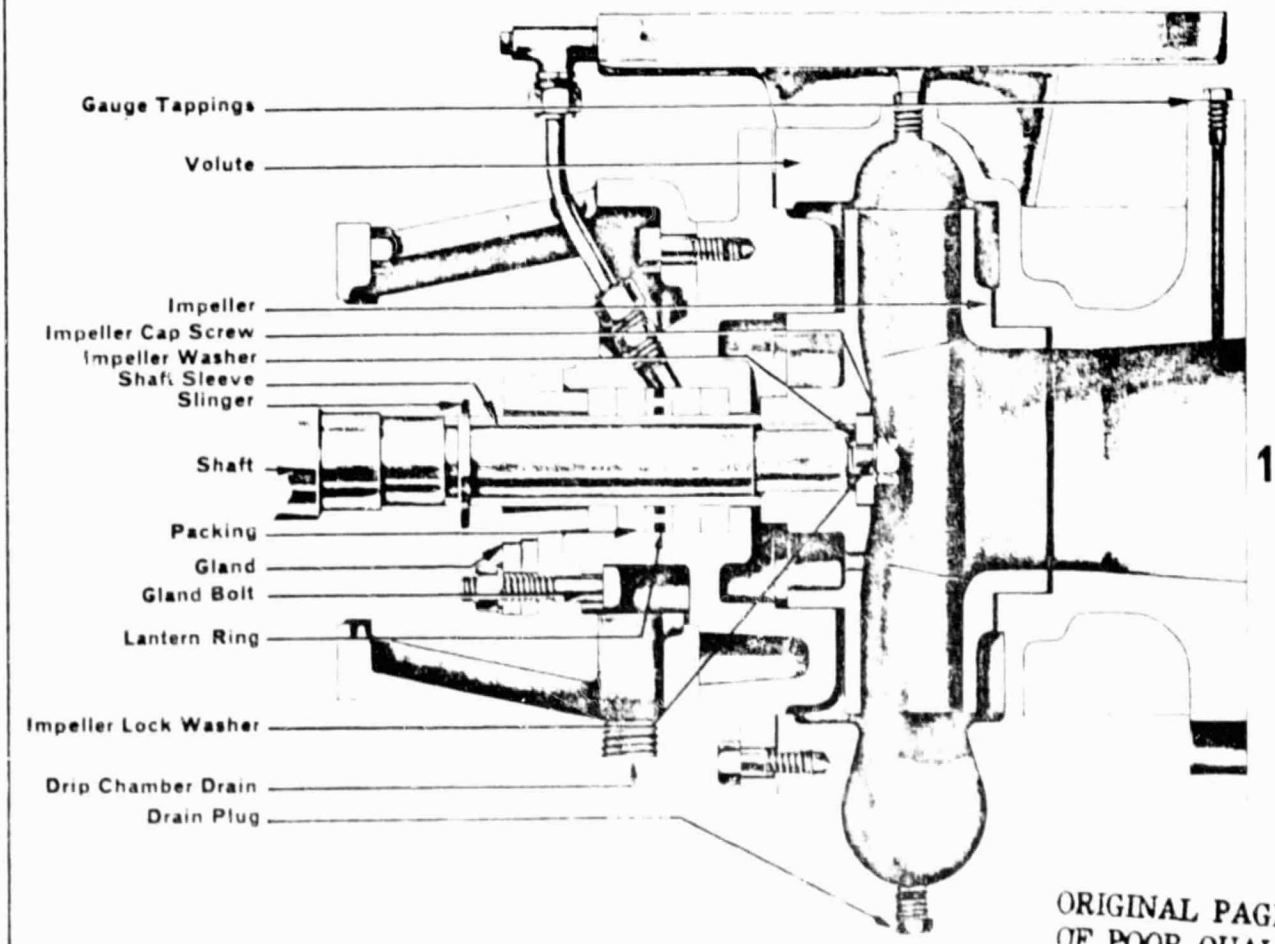
HEAVY DUTY MOTOR

COUNTER-BORED
MOTOR PUMP BRACKET

100% FACTORY
TESTED



1531

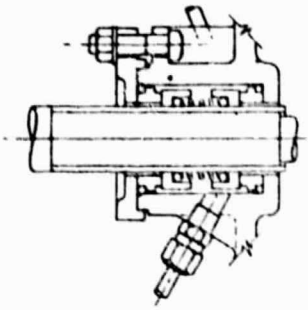


1531-PF

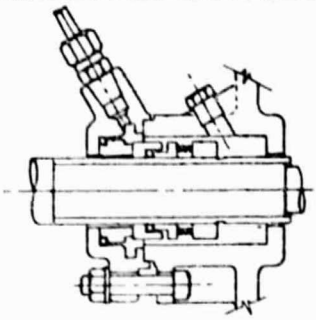
Construction Materials (for parts in contact with fluid pumped)

STANDARD MECHANICAL SEAL

DESCRIPTION	BRONZE FITTED PUMP	ALL IRON PUMP	ALL BRONZE PUMP
Impeller	Bronze	Cast Iron	Bronze
Impeller Key	Stainless Steel	Stainless Steel	Stainless Steel
Impeller Washer	Brass	Steel	Brass
Impeller Lock Washer	Stainless Steel	Stainless Steel	Stainless Steel
Impeller Screw	Stainless Steel	Stainless Steel	Stainless Steel
Shaft	Steel	Steel	Steel
Shaft Sleeve	Aluminum Bronze	Stainless Steel	Aluminum Bronze
Slinger	Neoprene	Neoprene	Neoprene
Volute	Cast Iron	Cast Iron	Bronze
Volute Gasket	Impregnated Paper	Impregnated Paper	Impregnated Paper
Seal/Seat	Carbon/Ceramic	Carbon/Ceramic	Carbon/Ceramic



1531-D OPTIONAL
Double mechanical seal



1531-S OPTIONAL
Single mechanical seal

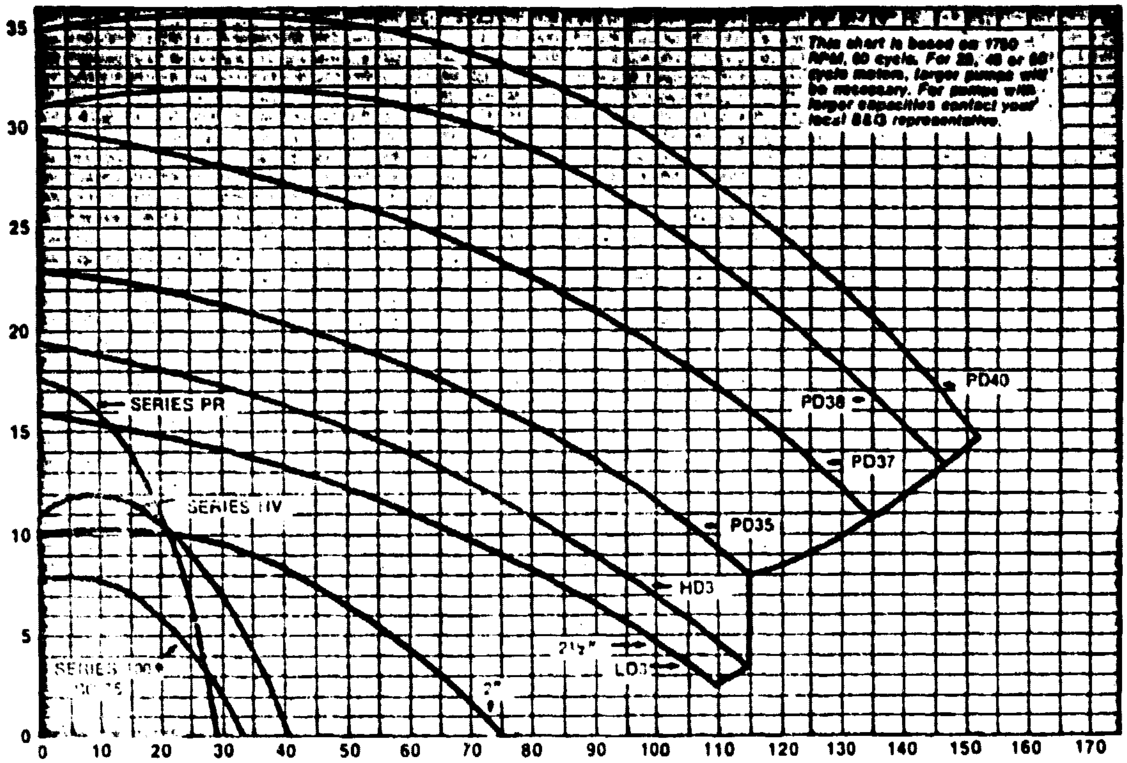
Construction Materials (for parts in contact with fluid pumped)

STUFFING BOX CONSTRUCTION

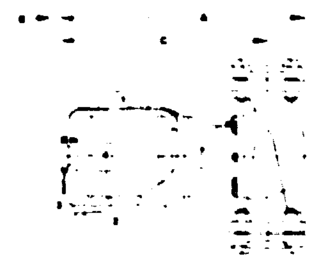
DESCRIPTION	BRONZE FITTED PUMP	ALL IRON PUMP
Impeller	Bronze	Cast Iron
Impeller Key	Stainless Steel	Stainless Steel
Impeller Washer	Brass	Steel
Impeller Lock Washer	Stainless Steel	Stainless Steel
Impeller Screw	Stainless Steel	Stainless Steel
Packing	Impregnated Asbestos	Impregnated Asbestos
Lantern Ring	Glass Filled Teflon	Glass Filled Teflon
Gland	Bronze	Cast Iron
Gland Nuts and Bolts	Stainless Steel	Stainless Steel
Shaft	Steel	Steel
Shaft Sleeve	Stainless Steel	Stainless Steel
Slinger	Neoprene	Neoprene
Volute	Cast Iron	Cast Iron
Volute Gasket	Impregnated Paper	Impregnated Paper
Shaft Seal/Seat		
(Single)	Tungsten Carbide/Carbon	Tungsten Carbide/Carbon
(Double)	Ceramic/Carbon	Ceramic/Carbon

IRON AND BRONZE BOOSTER PUMP

*Performance characteristics are based on using 1¼" or 1½" flanges. When using ¾" or 1" flanges performance will be slightly reduced.



MODEL NO	FLANGE SIZE NPT INCHES (specify size)	STANDARD 60 CYCLE MOTOR CHARACTERISTICS (special motors available on request) HP	φ	VOLTAGE	DIMENSIONS IN INCHES (open drip-proof) A	B	C	D	E	APPROX. SHPG. WT. LBS IRON BODY	BRONZE
SERIES 100	¾; 1 & 1¼; 1½	1/12	1	115 With Built in Overload Protection	15	6⅞	12⅞	[illegible]; ¾; 15/16	—; —	21	21
SC 75	SWEAT	1/12	1			7⅞	12⅞	—	—	—	20
SERIES PR	¾; 1 & 1¼; 1½	1/6	1		16¼	8½	13⅝	9/16; ¾; 15/16	—; —; —	35	37
SERIES HV	1; 1¼ & 1½	1/6	1		16¾	8½	13¼	⅝; ¾	—; —	28	30
2	2	1/6	1		17⅛	8½	14¼	11/16	—	40	42
2½	2½	¼	1		17⅛	10	14⅛	1 1/16	—	58	62
LD3	3	¼	1		17⅛	10	14⅛	1 1/16	—	55	60
HD3	3	⅓	1		18⅜	10	15⅜	1 1/16	—	60	65
PD35 S	3	½	1	115/230	20¼	12	17⅜	1 1/16	1⅛	78	83
PD35 T	3	½	3	208-230-460	20¼	12	16⅞	1 1/16	1⅛	75	80
PD37 S	3	¾	1	115/230	21¼	12	17⅞	1 1/16	1⅛	85	90
PD37 T	3	¾	3	208-230-460	20¼	12	17⅜	1 1/16	1⅛	82	87
PD38 S	3	1	1	115/230	24	14½	19⅝	1⅛	—	128	138
PD38 T	3	1	3	208 or 230-460	24¼	14½	19⅝	1⅛	—	125	135
PD40 S	3	1½	1	115/230	24⅜	14½	20⅜	1⅛	—	130	140
PD40 T	3	1½	3	208 or 230-460	25¼	14½	20⅝	1⅛	—	127	137



ELECTRICAL BOX ARRANGEMENT FOR BOOSTER PUMPS WITH BELL & GOSSETT MANUFACTURED MOTORS

Model Number	•1	•2	•3	•4
Series 100 and SC 75	All Std.	Other 1φ	3φ	—
Series HV and 2"	115 Volt 1φ Only	Other 1φ	3φ	—
Series PR 2½", LD3 and HD3		1φ	3φ	—
PD35 and PD37	—	—	All	
PD38 and PD40				All

MAXIMUM WORKING PRESSURE 125 PSI
MAXIMUM OPERATING TEMPERATURE

Standard Seal
225°F continuous
250°F intermittent on closed systems [illegible] duration temperature [illegible] combination and system [illegible]

[illegible] Seal
[illegible] F continuous [illegible] contact your B&G representative [illegible]

How to select a B&G Booster Pump

Required: 10 GPM at 6 ft. head. Look first at the bottom of the Booster Pump Capacity Chart where pump delivery is shown. Run a line straight upward from the 10 gallon point until it intersects a horizontal line from the 6 ft. head on scale at left. [illegible] pump [illegible] slightly above this [illegible] the proper selection [illegible] booster pump [illegible]

Seven Vital Points

Explain the preference for the B&G BOOSTER PUMP

The prime requisite of a forced hot water heating pump is quiet operation! In this respect the B&G Booster pump is completely outstanding.

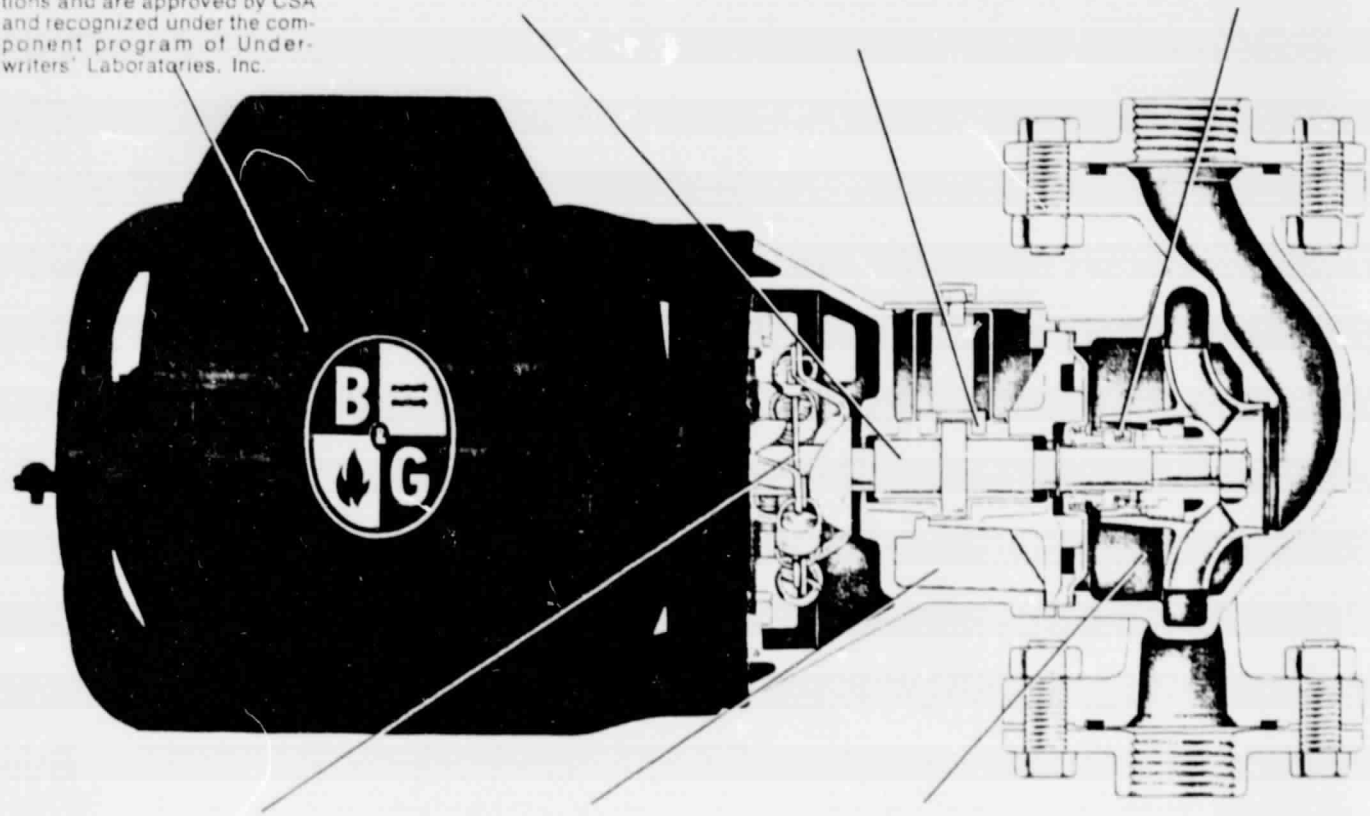
All open motors except 1 HP and 1½ HP single phase ratings are manufactured by Bell & Gossett to rigid specifications and are approved by CSA and recognized under the component program of Underwriters' Laboratories, Inc.

The B&G Booster pump shaft is big—oversized—affording large bearing surfaces.

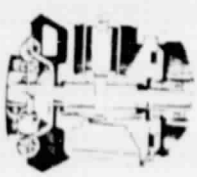
Note the thrust collar—an integral part of the shaft. It prevents end-thrust movement, a deadly enemy of seal and motor bearings.

Bronze, sleeve-type bearings are extra long to maintain the shaft in exact alignment. A special lubrication groove is machined into each bearing to provide a constant circulation of oil over the bearing surface. These features combine to assure smooth, dependable, quiet operation.

This seal provides protection against water leakage into the bearings and has a long record of successful operation. The extremely hard material of which the seal is made and its ingenious method of assembly assure long service.



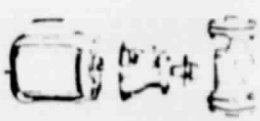
The arms of the Booster pump coupler are held together with springs—a design which dampens vibration and noise. Since elimination of noise is a primary consideration in heating pump construction, this flexible coupling is a notable feature of the B&G Booster pump. It has such a successful record it is used on all B&G in-line hydronic pumps through ¾ HP.



The oiling system of a B&G Booster pump is very simple and extremely effective. Oil is carried up by wool wicking from a reservoir and keeps the shaft and bearings in a continuous bath of oil.

The impeller is of true centrifugal design. The unique construction effectively prevents the accumulation of air at the seal face* which assures long seal life and quiet operation. Close tolerances between impeller and pump body keep water slippage to a minimum.

*Patent No. 3,341,607



Servicing of B&G Booster Pumps is simplified because the pumps are manufactured to rigid specifications and quality standards which assure complete interchangeability of parts.

By removing a few bolts, the Booster pump can be separated into three parts, permitting servicing without breaking pipe connections.

3

APPENDIX D

VERIFICATION

Quinta

VERIFICATIONS

1. Final Field Inspection

   A team consisting of Jay Forester, Ronald Wang (Owner's Representatives), Douglas Westrope (Department of Energy Representative), and Jack Lortie (Installing Contractor) met for final inspection on March 3 and 4, 1980.

   The installation was found to be complete and operating as called for in the plans. The control system was checked out and confirmed to be performing as designed.

2. Data Obtained During Final Field Inspection

   Please see attached sheets.

3. Acceptance

   The installation is considered completed and accepted.

Ronald K. Wang
Mechanical/Electrical Engineer
Development Division

RW:cs

Attachments

MOBILE LA QUINTA SOLAR INSTALLATION

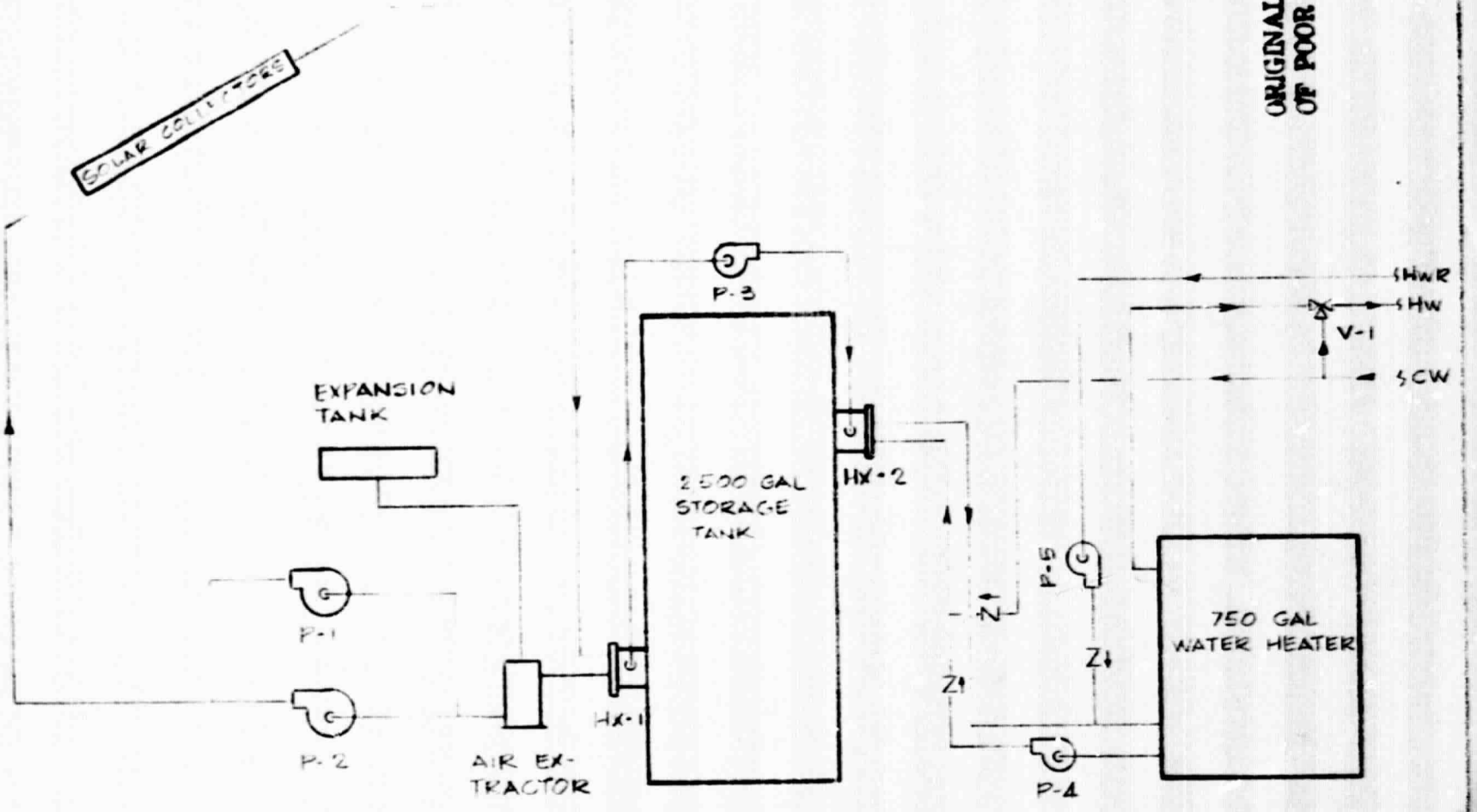
DATE		March 3, 1980		
TIME		2:00 pm	3:00 pm	4:00 pm
Solar Bank A Temp.,	°F	153	145	131
Solar Bank B Temp.,	°F	153	146	131
Solar Bank C Temp.,	°F	154	147	133
Solar Bank D Temp.,	°F	154	147	134
Solar Bank E Temp.,	°F	154	146	131
Solar Bank F Temp.,	°F	155	148	135
Solar Bank G Temp.,	°F	153	145	130
Solar Bank H Temp.,	°F	153	145	134
Solar Bank I Temp.,	°F	153	145	130
Inlet Temp. to HX-1 (Solar)	°F	155	150	134
Outlet Temp. from HX-1 (Solar)	°F	132*	135	118*
Inlet Temp. to HX-2 (HW)	°F	56	57	89
Outlet Temp. from HX-2 (HW)	°F	81	94	93
Insolation	BTU/sq. ft.	380	385	380
Solar Pump Flow	G.P.M.	38	38	38
Storage Tank Temp.,	°F	129	131	130

*Insulation downstream of sensor temporarily removed for inspection.

MOBILE LA QUINTA SOLAR INSTALLATION

DATE		March 4, 1980		
TIME		10:30 am	12:00 noon	1:30 pm
Solar Bank A Temp.,	°F	141	129	141
Solar Bank B Temp.,	°F	143	139	142
Solar Bank C Temp.,	°F	138	130	144
Solar Bank D Temp.,	°F	140	136	147
Solar Bank E Temp.,	°F	136	133	143
Solar Bank F Temp.,	°F	136	131	144
Solar Bank G Temp.,	°F	135	131	139
Solar Bank H Temp.,	°F	120	120	143
Solar Bank I Temp.,	°F	120	120	143
Inlet Temp. to HX-1 (Solar)	°F	132	130	143
Outlet Temp. from HX-1 (Solar)	°F	115	124	137
Inlet Temp. to HX-2 (HW)	°F	58	58	59
Outlet Temp. from HX-2 (HW)	°F	65	82	84
Insolation	BTU/sq. ft.	390	60 - 390+	80 - 120+
Solar Pump Flow	G.P.M.	38	38	38
Storage Tank Temp.,	°F	75	90	108

+Clouds passing overhead.



SOLAR SYSTEM SCHEMATIC

LA QUINTA MOTOR INN
MOBIL ALABAMA